

CLAIMS

1) A method for forming more rapidly a stochastic numerical model of Gaussian or related type representative of the distribution of a physical quantity in a porous heterogeneous medium, calibrated in relation to dynamic data obtained by measurements performed in the medium or previous observations, and characteristic of the displacement of fluids therein, comprising an iterative process of gradual deformation wherein an initial realization (y) of at least part of the medium is linearly combined, upon each iteration, with at least a second realization independent of the initial realization, the coefficients (α_i) of this linear combination being such that the sum of their squares is 1, and an objective function (J) measuring the difference between a set of non-linear data deduced from said combination by means of a flow simulator and said geologic and dynamic data is minimized by adjusting the coefficients of the combination, the iterative process being repeated until an optimum realization of the stochastic model is obtained, characterized in that the rate of gradual deformation to the optimum model representative of the medium is accelerated by selecting as the second realization to be combined with the initial realization at least one composite realization obtained by selecting beforehand a direction of descent defined as a function of the gradients of the objective function in relation to all the components of said initial realization (y).

2) A method as claimed in claim 1, characterized in that the composite realization is obtained by linear combination of a set of P independent realizations of the model, the coefficients of the combination being calculated so that the direction of descent from the

initial realization y is as close as possible to the one defined by the gradients of the objective function in relation to all the components of the initial realization.

3) A method as claimed in claim 1 or 2, characterized in that optimization is carried out from a deformation parameter which controls the combination between the initial
5 realization and the composite realization.

4) A method as claimed in claim 1 or 2, characterized in that, said combination affecting only part of the initial realization, the iterative process of gradual deformation is applied to a Gaussian white noise used to generate a Gaussian realization and the derivatives of the objective function with respect to the components of the Gaussian
10 white noise are determined.

5) A method as claimed in claim 1 or 2, characterized in that the initial realization is combined with a certain number M of composite realizations, all obtained by composition from P_m independent realizations of Y , the optimization involving M parameters.